are of value and are used at times in our clinic, but I place more reliance on bandaging the legs from the ankle to just below the knee and again from just above the knee to the groin very firmly with an Ace bandage and then directing the patient to walk for ten minutes. If the deep veins have already been occluded by previous disease, then occlusion of the superficial veins by the bandages will shut off all return circulation and the patient will have severe pain. One should rarely inject the veins of such patients.

Aged patients with sclerotic blood vessels are prone to develop thromboses in the veins even without injection, and are prohibitive risks. In one such case which I saw in consultation, the physician in charge of the case was disappointed when I opposed treatment of the patient by injection. Two days later, without having been injected, the old man developed spontaneously a severe phlebitis with a temperature of 104 degrees, from which he barely escaped with his life. Had I allowed his veins to be injected, the injections would have been blamed for the phlebitis and he would probably also have had a fatal embolism.

The English workers are extremely cautious about injecting patients who have distant foci of infection such as infected tooth roots and tonsils. On the other hand, Gaugier pays no attention to them. I am becoming gradually more liberal in these cases when the patients are young.

A history of previous phlebitis, or milk-leg, raises difficult questions. Gaugier, after trying it on eight such cases, finally decided never to inject them. The average worker will be wise in refusing to treat such cases. There are exceptional instances where it is allowable under extreme precautions to inject such, but the responsibility is very heavy. Each case requires individual study and surgical judgment.

Most fatalities have occurred after the use of hypertonic sodium chlorid or glucose, and I still withhold approval of their use in most cases. Contrary to the claims of some workers, I have a report of an enormous slough after glucose injection. A patient in this city died recently with a typical bichlorid of mercury poisoning after its use in injecting varicose veins. It should never be used. I still use sodium salicylate in very large veins, but use more and more the quinin solutions in the smaller veins, especially in those near the ankle. The quinin solutions are painless and almost never cause a slough. If quinin is used, the first dose should not exceed four minims, as occasionally a patient with a peculiar sensitivity to quinin will show a picture of alarming collapse if larger doses are given.

The best treatment for a venitis is simple bandaging of the part with an Ace bandage. The pain is at once relieved.

I would depart from the speakers in their advocacy of the time-honored treatment of phlebitis with hot applications. Such applications tend to cause alternate contractions and dilatations of the veins with resultant danger of dislodgment of a thrombus and embolism. The best treatment is rest in bed with an Ace bandage around the site of phlebitis. If one desires, he may follow Meisen's suggestion and apply pressure with a pelote over the vein near the fossa ovalis.

The suggestion made by the reviewer that in some cases the vein be first ligated high in the thigh before injection, is reminiscent of the old method which Tavel took over from Trendelenburg and practiced at Berne in 1904. It is still practiced by workers in Italy, but the records of this procedure show a higher incidence of embolism than does simple injection.

TRAUMATIC RUPTURE OF THE KIDNEY*

REPORT OF TEN CASES

By EDWARD W. BEACH, M. D.
Sacramento

DISCUSSION *by Miley B. Wesson, M. D., San Francisco; Louis Clive Jacobs, M. D., San Francisco.*

THIS article is written to emphasize: (1) the common occurrence of ruptured kidney as a pathological entity; (2) the pitfalls in exact diagnosis which call for urological skill; (3) conservatism, as the apogee of treatment.

To aid recapitulation it is fitting to consider the subject under appropriate captions.

Although Galen in 1561 described subcutaneous rupture of the kidney, little attention was paid to the lesion until the classical work of Royer in 1839. Within the last few years literature has been enriched by numerous contributions due, doubtless, to the increasing speed and complexity of modern civilization which supplies an endless chain of cases and to advancement in the practice of urology.

ETIOLOGY

The mechanism of forces that produce traumatic rupture is somewhat controversial. For practical purposes it may be considered that the force of the impact is sufficient to compress the kidney between the floating ribs above, and the transverse processes of the vertebrae beneath, generally the first and second lumbar. Any pathologic condition of the kidney, especially one characterized by increased intrarenal pressure predisposes to rupture since in these cases there is usually a coincidental thinning of the renal parenchyma. In such a kidney only a slight blow or concussion, as a fall upon the buttocks, or a sharp muscular flexion, may precipitate a fracture. Rupture of the kidney is apparently commonest in men, more frequent on the right side, and the site is most often the posterior surface.

CLASSIFICATION

From the standpoint of pathology, Tuffier's original division into (1) ecchymosis, (2) subcapsular rupture, (3) transcapsular or total rupture, stands unchallenged. The latter group may or may not involve the kidney pelvis.

Many cases of ruptured kidney fall into the subcapsular category, and are benign clinically, responding promptly to expectant rest in bed. There is little blood loss usually, since the oozing from the lacerated surface is promptly checked by internal resistance. Degeneration of damaged secretory tissue rapidly follows, leaving in its wake the inevitable fibrous tissue substitution. Functionally, as indexed by the dye test, there is little detectable damage remaining.

Complete fracture of the kidney offers a different problem because of hemorrhage and extravasation of the urine. The hemorrhage is seldom sufficient to cause death in a few moments except where the pedicle is torn, and this alone is a rare

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accident. In cases coming to the autopsy table as a result of terrible external violence, other visceral injuries frequently overcast the kidney picture. Doctor McDonnell, Sacramento County physician for fifteen years, has autopsied ten cases with torn kidney pedicles, all with other grave concomitant lesions such as ruptured liver, spleen, etc., and in each case death had occurred in a brief interval after the accident. In other words, an application of force of sufficient vehemence to tear the pedicle of the kidney in its deep and protected position is prone to injure as seriously contiguous vital organs.

The hemorrhage from the torn surface may form a huge clot about the kidney, completely surround the organ and stop bleeding by internal pressure. It may cease by thrombosis of the renal vessels or the ooze may continue slowly for several days, forming a huge mass in the loin and gradually reduce the hemoglobin to a surprising degree. In rare cases the peritoneum is torn, and bleeding occurs intraperitoneally. In these cases the lesion is almost always on the anterior or ventral kidney surface.

Extravasated urine, if sterile, may be absorbed in small quantities; but it more often becomes infected and constitutes a retroperitoneal abscess. In other cases the urine diffuses through the tissues and sets up an extensive cellulitis. A collection of urine in the loin always augurs the presence of an injury through a calyx or into the renal pelvis. Lacerated kidney tissue *per se* is unable to secrete urine.

In the transcapsular type of rupture where a single lesion exists, it is more often transverse, due probably to the fact that the kidney development is parallel to the tubules and vessels.

Rupture of the kidney pelvis alone is extremely rare owing to its sheltered position, its great depth and inherent muscular properties. Even under maximum distention it seldom ruptures, the kidney itself usually bearing the brunt of any blow.

SYMPTOMS

There is a wide diversification of the clinical picture presented. In severe cases the patient is acutely and critically ill.

Shock and Collapse.—There is always some shock. It may be of momentary duration only and the patient continue with his work, as in case seven, or it may continue, as it did in Cases 1, 2 and 3, for several days. It may be slight at the outset only to become magnified later, due to continued hemorrhage, as in case ten. The most extreme cases of shock are encountered, it seems, in intraperitoneal bleeding. The shock bears a direct relationship in many cases to the character and magnitude of applied external force rather than to the extent of actual kidney injury.

Hematuria is the most constant of all signs, though not infallible, because it may occur early and subside quickly. It may continue in the form of decolorized red blood cells and free blood pigment for a considerable time after the accident.

Mass in the Loin.—This occurs only in the complicated cases and varies in size, extent, and rapidity of accumulation. The location of the injury to the kidney determines whether the mass consists of blood, urine, or both. It rarely appears in cases which show injury to the ventral kidney surface.

Pain and Tenderness.—Pain is experienced both in front and in the back over the affected side, also often low in the groin. Tenderness is not only elicited in the lumbocostal angle, but is often widespread anteriorly and posteriorly.

Muscle Rigidity.—Often unilateral, it may involve the abdominal muscles on both sides. The leg on the affected side is also drawn up at times.

Evidence of Peritoneal Irritation.—This group of symptoms often clouds the picture. Nausea is most common, vomiting is frequently present, as likewise is tympanitis. Hiccough is rarer.

Temperature is slightly elevated, rarely above 101 degrees Fahrenheit at the beginning.

White blood cells are rarely above 20,000, and often 15,000.

Hemoglobin is usually decreased in direct proportion to the bleeding.

Coincidental injuries are: contusions, abrasions or ecchymosis over the side involved, fractured ribs, traumatic pneumonia, internal injuries, etc.

DIAGNOSIS

Simple fractures of the kidney are not uncommon in industrial practice. Because they simulate intraperitoneal lesions and often ameliorate rapidly under watchful waiting in bed, the diagnosis may be overlooked. Careful history taking and diligent observation of clinical signs are essential. Possibility of kidney rupture should be thought of in all cases of force applied to the loin. Concurrent injuries should not be allowed to obscure the underlying renal injury. All suspicious cases warrant careful study by a trained urologist. Pyelograms are invaluable in many cases to confirm the diagnosis, to accurately depict the lesion and to provide an unabridged description thereof.

Even superficial study reveals the multiplicity of symptoms presented by these cases and demonstrates the arduousness of accurate correlation. In simple cases, even though the patient demonstrates all presumptive evidence of ruptured kidney, the evidence is presumptive only and not conclusive. Might the accident not activate previously "silent" pathology in the affected side? A clinical diagnosis made by inference is not a comprehensive and scientific one, or, in the words of Doctor Deaver, "You walk by faith and not by sight." The valuable information obtained and the brief interval required to do a pyelogram more than compensate for any inconvenience or possible hazard to the patient. However, at times the patient's condition precludes their employment and a nicety of judgment is requisite in the decision.

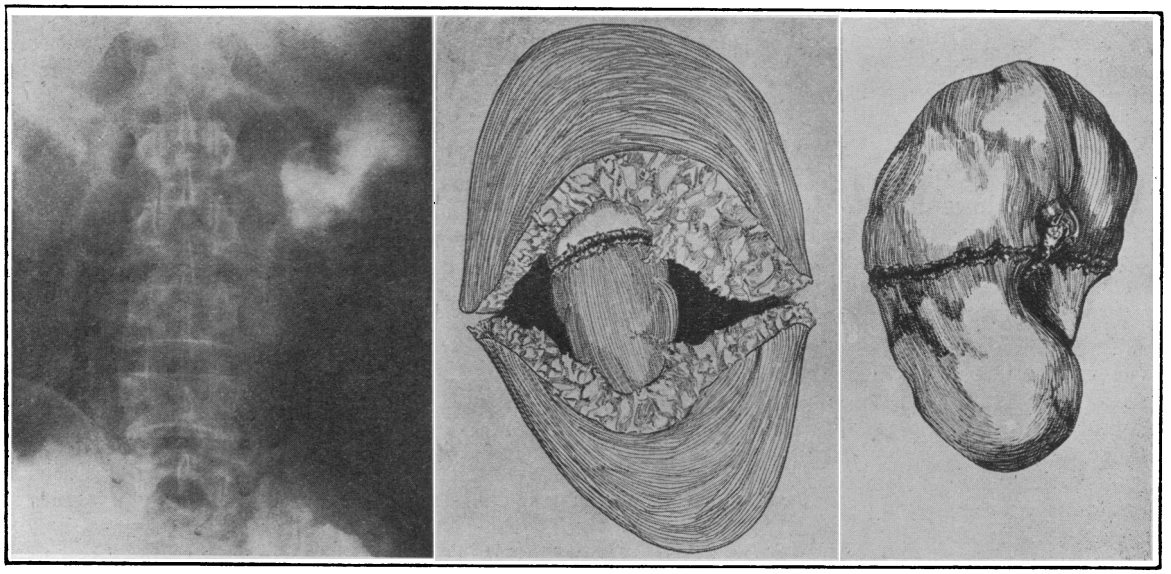

Fig. 1 (Case 1).—Rupture through middle calyx with extravasation of pyelographic medium in the tissues.

Fig. 2 (Case 1).—Organized blood-clot showing lacerated bleeding kidney within.

Fig. 3 (Case 1). — The upper half of the kidney was blanched and ischemic. The lower portion showed some mottling, but for the most part was red and congested.

TREATMENT

This might be compressed into assiduous study, precise interpretation of the clinical signs and conservatism whenever possible.

At first, of course, expectant watching and appropriate measures are necessary to combat shock. It is true that many cases get well if left alone, but it is equally true that other cases are retarded in recovery and actually jeopardized by an unwise "Pollyanna" attitude. Especially is this true in cases which have urinary extravasation, where sluggish action may necessitate a nephrectomy or may even spell death. Likewise prompt action is called for in cases of intraperitoneal bleeding.

In cases showing a loin tumor which rapidly increases in size, thus giving evidence of continued internal hemorrhage, or in doubtful cases an exploratory operation is indicated. The patient's condition permitting, the entire kidney and pelvis should be exposed and carefully searched for tears, rents or lacerations.

Extreme conservatism should now be manifested and a nephrectomy be done as seldom as possible. Badly comminuted or pulpified kidneys necessitate removal, as do also kidneys which evidence gross preëxistent pathology. Extensive damage to the pelvis or a complete transverse tear here also calls for nephrectomy. Resection in suitable cases is infinitely preferable to removal.

Bleeding can usually be controlled by sutures and, if necessary, a bit of fat may be used as a brace to prevent the sutures cutting through the kidney tissue. Packing is rarely necessary.

Ample drainage must be given in all cases. In many cases a fistula persists for several months after operation, especially if the case is complicated by copious extravasation of blood or urine.

REPORT OF CASES

Case 1.—The patient, a 43-year-old male, fell about thirty feet, landing with his right loin across a fallen tree trunk. He was kept in the camp hospital because of shock and a compound fracture of the right arm. November 1, 1927, five days later, I saw him because of his hematuria. He looked extremely ill and vomited continuously. He had a tympanitic abdomen with a huge tender mass in the right loin. The abdominal muscles on the right side were rigid and the right leg flexed. The urine contained free blood pigment and 120 to 130 decolorized red blood cells per high dry field. Temperature was 100.5 degrees Fahrenheit; hemoglobin, 52 per cent; and white blood count, 15,800.

On cystoscopy the left kidney was normal. From the right ureter issued decolorized red blood cells and blood pigment. The phthalein appeared in ten minutes and only 10 per cent was recovered in thirty minutes. Fifty cubic centimeters of sodium iodid was slowly injected without the production of any pain or spasm (Fig. 1).

Operation was performed immediately after this examination. Upon opening the quadrangular space we came upon a huge chocolate-colored, ovoid mass extending above, up under the diaphragm and far down into the iliac fossa below. This mass could not be freed from the surrounding tissues, so an incision was made therein. The huge organizing blood-clot was found to be about two inches thick, and at the center lay the kidney (Fig. 2). A single fracture line was evident, directly in the middle of the kidney, blood continuing to ooze with each heart beat from the lacerated surface (Fig. 3). Nephrectomy was done and as much as possible of the huge clot was removed.

Laboratory examination of the specimen showed atrophic and degenerative changes in the tubules of the anemic portion and numerous infarcts in the turgid lower portion.

Patient made a recovery uneventful excepting for a fistula, which persisted for six months following the operation.

Comment.—In the light of subsequent study I believe a resection would have been the operation of choice here.

Fig. 4 (Case 2). — A rupture of the middle calyx with extravasation of pyelographic medium.

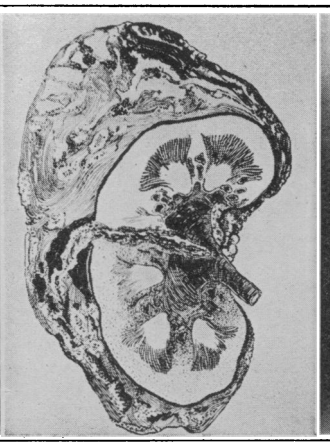

Fig. 5 (Case 2). — A schematic drawing of the findings at operation.

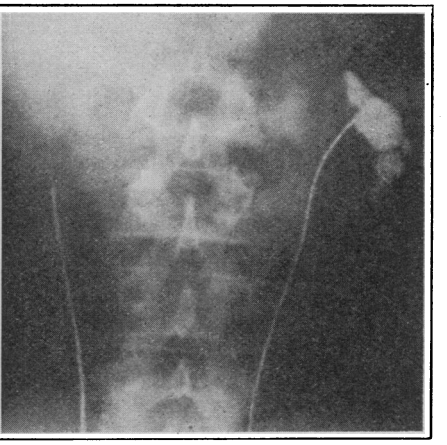

Fig. 6 (Case 2).—Pyelogram made one year after rupture, showing destruction of the middle calyx by scar formation and some blunting of the upper calyx.

Case 2.—The patient, a 33-year-old male, on November 18, 1927, fell ten feet, striking his left loin on a pile of timber. He was hospitalized at the camp for three days because of shock, and I saw him five days later. He stated that he voided bright blood immediately after the accident, but twenty-four hours later the urine was clear.

He looked acutely ill. There was a large tender mass in the left loin. Abdominal muscles were fixed as a whole, and moderate distention, with slight nausea and no vomiting, was present. Temperature was 100 degrees; pulse, 108; hemoglobin, 54 per cent; white blood count, 14,900. Urine showed fifty red blood cells per high dry field.

Provisional Diagnosis.—Rupture of the left kidney. Patient was cystoscoped to gain additional information and to confirm the diagnosis. Righ kidney was normal. Blood flowed entirely from the left kidney. In the left kidney phthalein appeared in three and one-half minutes, 20 per cent in thirty minutes. Sixty cubic centimeters sodium iodid was slowly injected with no pain and no spasm (Fig. 4).

Operation immediately followed. Exposure of the perinephritic tissues disclosed over a quart of jelly-like clots, urine and free blood surrounding the kidney. A transverse tear in the cortex of the kidney, radiating upward, was revealed about five centimeters in length, through which the finger could be introduced into the pelvis (Fig. 5). Bleeding was controlled by sutures and pressure packing.

Following operation, urine leaked profusely from the wound for one week, then it gradually ceased and became entirely dry on the twelfth day. Patient was discharged on the twenty-first day. A small fistula persisted for over three months.

One year later the patient reported that he experienced no bad effects from his accident except that he was not so strong as previously. He occasionally had backache when he worked strenuously. A cystoscopy with pyelogram was done. The phthalein appeared on the left side in three minutes, and 25 per cent was excreted in thirty minutes (Fig. 6).

Comment.—This case proves the value of conservative treatment.

Case 3.—The patient, a 41-year-old male, on May 13, 1924, while crossing a railroad, riding upon a load of hay, tumbled and fell across the rails upon his left loin. He was taken to a hospital nearby in profound shock, where he was treated for fractured ribs, and traumatic pneumonia, which was subsequently diagnosed empyema. Following the accident, he complained bitterly of pain over his left loin, at the site of the rib fracture, but his symptoms were made difficult by the fact that he could speak no English. He voided bright red blood at first, but it cleared directly.

His fractured ribs, with the subsequent pneumonia, overshadowed the underlying kidney lesion. It was not until two weeks later that his urine was examined and found to contain pus and blood, and then only after a huge swelling had appeared in the left loin. He suffered chills, high fever, sweats, and gradually became weaker and emaciated. On June 9, when I saw him he was practically moribund.

Under local anesthetic an incision was made in the loin and evacuation of probably a gallon of foul-smelling urine and pus followed. A large drainage tube was placed in the side.

About ten days later a Garceau catheter was introduced into the left kidney, but no urine flowed from the catheter. Sodium iodid, injected, did not distend the kidney, but flowed through the fistula in the loin.

The patient's condition improved steadily. The urinary drainage from the side began to decrease the fifteenth day. The patient left the hospital two weeks subsequently. He would permit of no cystoscopy at

Fig 7 (Case 3).—One year after traumatic rupture of kidney. Pyelogram made with eighteen-inch column of sodium iodid. (Courtesy of Dr. Miley B. Wesson.)

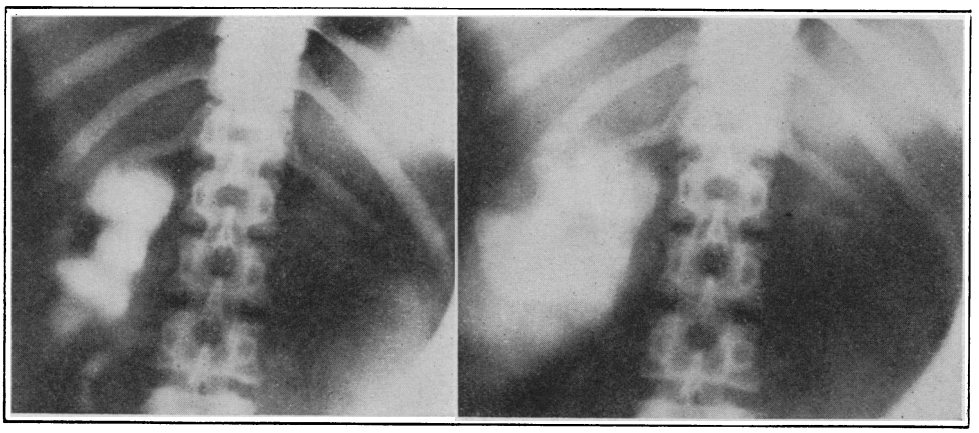

Fig. 8 (Case 4).—Injection of hydronephrotic sac with forty cubic centimeters of sodium iodid.

Fig. 9 (Case 4).—Same as Fig. 8, showing the sodium iodid flowing out into the perinephritic abscess.

this time. A small fistula persisted for six weeks. One year later the urine was uninfected, the phthalein was decreased 50 per cent, and pyelogram showed destruction of the middle calyx (Fig. 7).

Comment.—This case shows some of the difficulties of diagnosis. All attention was focused upon the rib fracture and the resultant chest condition, and the kidney was overlooked. There was a fracture through the middle calyx and pelvis of the kidney, through which urine slowly seeped.

* * *

CASE 4.—The patient, a 41-year-old woman, was first seen November 6, 1922. She had complained of "cystitis" for fifteen years, and eight years before had obtained temporary relief by a kidney fixation.

She complained of backache, pain over the right side, exhausting night sweats, loss of weight, and dysuria. Her white blood count was 19,600, and hemoglobin 70 per cent. Examination of the urine showed this to be pus-laden, containing mixed infection. Repeated examination demonstrated no Koch's bacilli. A catheter introduced into the right kidney after repeated attempts, due to an obstruction about two and a half inches outside of the bladder, demonstrated the presence of a large hydronephrosis with only a trace of phthalein in thirty minutes. The left kidney was normal. Operative removal was advised, but the patient refused. Dilatation of the ureter facilitated drainage of the sac, and this probably gave her temporary relief.

She was next seen on April 27, 1925. She reported that four days prior, while attempting to rise from a sitting position, she had experienced a lancinating pain in her right side. She slid to the floor, striking her loin a slight blow on the side of the bed and had suffered great pain in the right side ever since. There was little or no shock at the time the accident happened. She was having chills, fever, and sweats. She vomited constantly and looked extremely toxic. There was a small tender mass in the right loin, rigid abdominal muscles, and a 24,200 white blood count. Plain x-ray showed only an increase in the kidney shadow. A tentative diagnosis of ruptured hydronephrosis with perinephritic abscess was made. For scientific purposes a catheter was introduced into the right kidney after the patient was under an anesthetic. Accompanying pyleogram showed extravasation (Figs. 8 and 9).

Operation. — At operation a large quantity of thin pus was evacuated from the loin. The site of the fracture was a small tear near the upper pole. Owing to the patient's condition, no attempt was made to remove the sac at this time. A large tube was used as a drain. Urine escaped from the incision for two weeks, when it gradually ceased. Patient would consent to no subsequent operation and left the hospital.

Comment.—There is some possibility that this case belongs in the spontaneous category. Being familiar with the case urologically beforehand, no difficulty was experienced in making a diagnosis.

* * *

CASE 5.—This patient was an 18-months-old male who had never been sick. After a long journey to Oregon, his mother noticed that each time he urinated the diaper was stained with pus and blood, and that he cried lustily following the act. He disliked being moved and was extremely tender over his right side. He refused feedings, and the temperature ranged from 103 to 105. After resting a few days in Oregon, during which the patient grew steadily worse, he was brought by automobile four hundred and eighty miles to Sacramento. His condition then was critical.

On his arrival, August 21, 1924, examination showed a mass in the right loin, rigid muscles, and marked emaciation.

Operation was performed by Dr. J. B. Harris, who made an incision in the loin and found a quantity of cloudy fluid; both kidney and ureter being of unusually large size. Urine, however, could be squeezed easily into the bladder through the ureter. Owing to the precarious condition of the patient, no delivery of the kidney was carried out. An incision was made into the ureter for drainage.

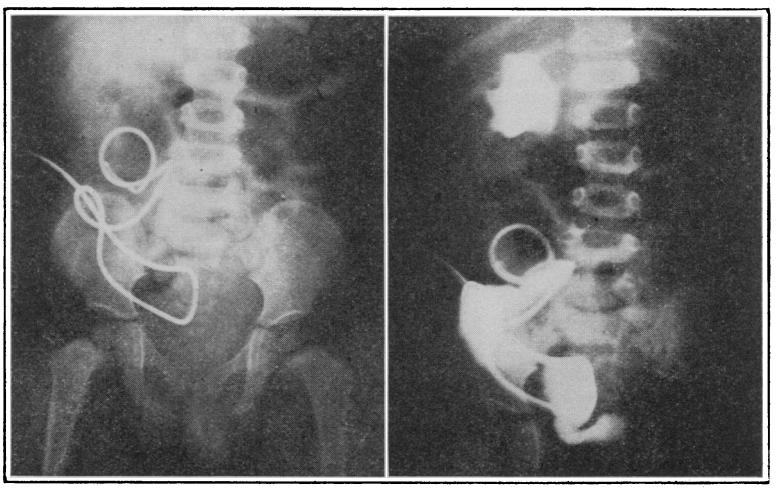

Fig. 10 (Case 5).—A catheter introduced into a hydro-ureter through the loin.

Fig. 11 (Case 5).—A pyelogram made by injecting a hydro-ureter through a loin incision.

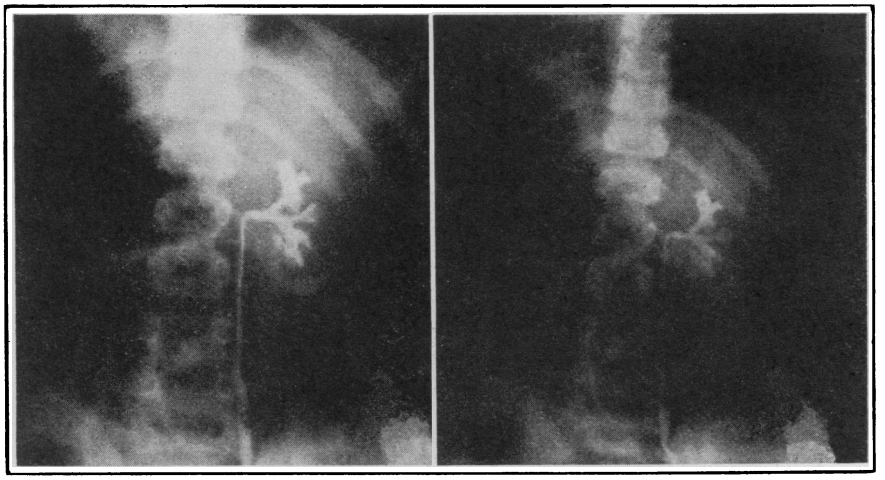

Fig. 12 (Case 6).—Subcapsular rupture through lower calyx.

Fig. 13 (Case 6).—Spontaneous repair of subcapsular rupture.

When I saw him a week later his general condition was greatly improved and his temperature was normal. Urine was pouring out copiously through the drainage tube. The tube was removed and a ureteral catheter introduced through the fistula in the loin. No cystoscope could be introduced into the bladder because of some anatomical deviation at the bulb. However, a nasopharyngoscope was easily introduced and the right ureteral orifice appeared normal. Mercurochrome-220 injected through a catheter in the fistula appeared quickly in the bladder. A Garceau catheter was introduced into the ureter through the loin (Fig. 10) and, although there was some leakage, 15 per cent phthalein was collected in thirty minutes. A pyelogram was then made (Fig. 11). The fistula closed in twenty days. The urine was sterile, but contained about twenty pus cells per high dry field.

Comment.—This was undoubtedly a case of subcapsular rupture of the kidney, secondary to increased hydraulic pressure, due to an obstructive hydro-ureteral angulation. It demonstrates the difficulty of diagnosis in the absence of pyelography.

* * *

Case 6.—An eight-year-old boy was playing on the roof of the family garage on November 19, 1928, when he lost his footing and tumbled off in such a manner that his right loin struck a rail fence at the side of the building.

There was some shock and nausea which soon subsided, and directly he voided bright red blood. When I saw him in the hospital his temperature was 99.8 degrees Fahrenheit; white blood count, 13,400; urine showed blood cells too numerous to count. No mass appeared in the right loin. The blood continued unabated in the urine for four days, when a pyelogram was done. Sodium iodid, eight cubic centimeters, was slowly injected. Pyelogram showed subcapsular fracture with the injecting fluid collected beneath the capsule, apparently connecting with the lower calyx (Fig. 12). The tenderness over the right side slowly subsided. Blood cleared following the pyelogram, but returned about a month later, following a strenuous ball game. A pyelogram showed that the tear had healed (Fig. 13). Phthalein was normal.

Comment.—A subcapsular rupture that healed spontaneously with rest and hematuria stopped by pelvic irrigation, as in essential hematuria.

* * *

Case 7.—A twenty-two-year-old male fell across a garage pit striking his right loin lightly, the force of the fall being broken by his arm. He felt weak, but continued his work for the remaining fifteen minutes of the day.

The next day he complained of tenderness over the right loin and was "faint" when he stood on his feet. He entered the Sisters' Hospital that day complaining of slight dysuria, nausea, pain over right loin (both anteriorly and posteriorly), and in the lower right iliac region. Red blood cells forty to fifty per high dry field in the urine. White blood count, 18,600; temperature, 99 degrees. Plain x-ray negative.

No mass appeared in the loin and the pain gradually subsided. Blood in the urine slowly cleared and white blood count fell. Patient would permit of no cystoscopic examination. In two weeks symptoms disappeared and patient was able to return to work.

Comment.—This was clinically a case of simple rupture of the kidney, which responded to expectant rest in bed. This case demonstrates the lack of accuracy in a clinical diagnosis. Were it not for the blood in the urine the symptoms would have justified a diagnosis of appendicitis.

* * *

Case 8.—A twenty-month female who had been sickly and delicate since birth, had been under medical treatment for one month because of pyuria. I saw her on April 18, 1927, because two days prior, while sitting upon a rocking horse, she tumbled off on her right side, and since that time she had been exquisitely tender over this loin. Temperature was 103 to 105 degrees. She vomited continually. Urinated every fifteen to thirty minutes, the act provoking great distress; urine had a foul odor, contained white blood cells, too numerous to count, and many red blood cells. No mass could be felt in the loin.

Urologic examination revealed on the right side a tight ureteral obstruction about one and a half inches outside of the bladder. The impediment was gradually dilated with a ureteral bougie, and a No. 7 French catheter was introduced into the kidney. Phthalein appeared in five minutes, 10 per cent in thirty minutes, and a pyelogram made by slowly injecting five cubic

Fig. 14 (Case 8).—A subcapsular rupture through the upper calyx of an infected kidney of a twenty-month infant, following a fall from a rocking-horse.

centimeters of sodium iodid (Fig. 14) showed a rupture of the kidney with a collection of the sodium iodid beneath the capsule near the upper pole. At present the urine is uninfected and the phthalein is normal.

Comment.—Dilatation of the ureteral stricture for drainage followed by irrigation of pyelographic media, and rest in bed resulted in a cure of not only a subcapsular rupture, but also the preëxisting intractable pyuria.

* * *

CASE 9.—A 31-year-old male had complained of a dull, dragging pain in the right loin for about two years. He fell and broke his back in May 1925. Shortly after a successful bone transplant he developed a persistent fever, with chills, sweats, headaches, and loss of appetite.

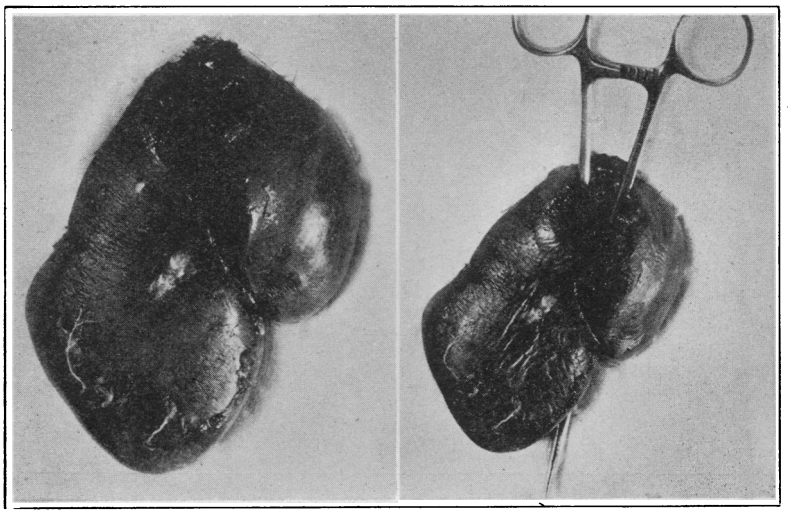

Fig 15 (Case 10).—Showing laceration on ventral surface of the kidney with hemorrhage intraperitoneally.

Fig. 16 (Case 10).—Hemostat through laceration into kidney pelvis. The latter in direct communication with peritoneum via laceration.

The x-ray showed the presence of a pyramidal stone in the pelvis of the right kidney. The base of the stone was more or less rounded, occupying a lateral position, the apex being medially directed. There were two or three small spicules coming off the larger stone, which apparently filled most of the pelvis. These spicules radiated toward the calices. Cystoscopically the left side was normal. Right side infected, trace of phthalein in thirty minutes. No pyelogram was done because the stone almost filled the pelvis.

At operation, August 3, 1925, the small, sharp tip of the stone was found to have perforated the anterior wall of the pelvis and there existed a small pocket filled with pus and urine well walled off from the surrounding tissue, but communicating with the pelvis by the minutest of openings. The keen edge had, apparently, thinned the pelvis to the point of breaking. The process, however, must have been a slow seepage, since it was so completely taken care of by nature, and hemmed in against dissemination.

The stone was removed quite easily through the pelvis. The cul-de-sac about the pelvis drained and the patient made an uneventful recovery except for prolonged urinary drainage lasting three weeks.

Comment.—This case illustrates the point that a stone may erode through the pelvis. The accident the patient suffered may not have been an exciting factor, although I think it was.

* * *

CASE 10.—A 47-year-old male was pinned between the steering wheel and the door of his auto when the latter somersaulted down a thirty-foot levee. He was hospitalized for observation on account of shock and three broken ribs on the left side. I saw him, because of suspected kidney rupture, about twelve hours later at the Rideout Hospital, Marysville.

He presented the following: blood and clots in the urine; rapidly increasing shock; accelerated and shallow respirations; feeble running pulse, 132 to 144; constant vomiting; and extreme thirst. His hemoglobin was 30 per cent. Exquisite pain existed over the left costovertebral angle, but no mass. Abdomen was soft, with considerable tympanitis and some shifting dullness in the flanks. Every body movement provoked great pain.

His extreme condition precluded accurate diagnosis other than to establish the fact that the blood came entirely from the left kidney. Provisional diagnosis of intraperitoneal kidney rupture was made. He never reacted from the shock. Autopsy showed a rupture of the kidney on the anterior and upper surface (Figs. 15 and 16). There was also a large torn mesenteric vessel just in front of the kidney. The pelvis of the kidney communicated directly with the peritoneal cavity via the rupture.

Comment.—This is the rarer type of kidney rupture as to location, accompanied by intraperitoneal bleeding, illustrating the attendant profound shock.

CONCLUSIONS

1. Traumatic rupture of the kidney is more frequent than the spontaneous variety and is invited by existent renal pathology.

2. Rupture may be divided arbitrarily into two groups: (*a*) Mild or subcapsular. (*b*) Complicated or transcapsular.

3. Trauma to the loin is frequently provocative of subcapsular laceration. This is usually benign, clinically, but may be confused with intraperitoneal lesions.

4. Transcapsular rupture begets both hemorrhage and urinary extravasation.

5. Hemorrhage following rupture of the kidney is seldom lethal and rarely dangerous.

6. Extravasation of urine denotes injury to the renal pelvis or through a calyx, and necessitates prompt action.

7. The symptoms are diversified, but the most constant is hematuria. Either concurrent injuries or evidence of peritoneal irritation are prone to cloud the picture.

8. A presumptive diagnosis may be made by analysis of the symptoms, but a comprehensive one is possible only with use of pyelograms or surgery.

9. Treatment, other than expectant observation in bed, calls for nice judgment between too great complacence and too great enthusiasm surgically.

10. If doubt exists, err on the radical side and investigate.

11. Nephrectomy is to be done only as a last resort.

12. Brilliant results recompense conservative effort.

13. The paper presents for study the following cases:

(*a*) Rupture of the kidney with the formation of a huge perirenal clot; nephrectomy; cure.

(*b*) Rupture of the kidney with a ragged line of continuity; extravasation of blood and urine; suture and pressure packing; cure.

(*c*) Rupture of the kidney through the lower calyx and pelvis, confused with a traumatic pneumonia and supposed empyema; late incision and drainage of infected extravasation; cure.

(*d*) Spontaneous rupture of a hydronephrotic sac; incision and drainage; cure.

(*e*) Rupture of a congenital abnormal kidney in a child eighteen months of age; incision and drainage; cure.

(*f*) Subcapsular kidney rupture, diagnosis confirmed by pyelogram in a boy of eight; palliative treatment; cure.

(*g*) Clinical course indicated laceration of the kidney, but early symptoms could have been easily confused with appendicitis.

(*h*) Subcapsular rupture of the kidney in a girl twenty months of age; dilatation of ureteral stricture; cure.

(*i*) Traumatic rupture of pelvis by sharp stone; pyelolithotomy and drainage; cure.

(*j*) Intraperitoneal rupture of the left kidney, followed by profound shock and death.

Medico-Dental Building.

DISCUSSION

Miley B. Wesson, M. D. (490 Post Street, San Francisco).—Traumatic rupture of the kidney is not a rare condition. Practically every surgeon has seen one or two, a few have seen more, and in all about nine hundred cases have been reported in the literature, but in many of these the diagnosis is based on symptoms alone.

Doctor Beach's series is unique. Ten patients with traumatic rupture of the kidney have been seen in his private practice during the past five years. The diagnosis of only one of his cases was based on symptoms alone; the others were all proved by pyelograms or the operative findings. His treatment has been conservative, six patients being operated upon and only one nephrectomy done.

Primary nephrectomy should never be done except for a torn renal pedicle. Subcutaneous ruptures of the kidney heal without operation and with a function loss of 50 per cent, or less. By saving a ruptured kidney we preserve a useful organ, even though its function is somewhat impaired by the cicatricial bands strangulating some of the parenchymatous elements of the organ. Furthermore, in case of subsequent destruction of the uninjured kidney the impaired one is able to do all the work.

The one fatality in this series was a death from shock due to intraperitoneal renal hemorrhage. No surgery was attempted, as the operative treatment of rupture of the kidney is always secondary to the therapy of shock.

Hematuria is not an indication for operation, but is merely a signal, while the hematoma is the measure of the lesion. Hemorrhage within the capsule is generally stopped by the hematoma and requires no surgery. Very often the same is true of a tear through the capsule or pelvis and the hematoma or urinary extravasation will absorb, accompanied of course by an elevation of temperature. There is always the possibility of the extravasation becoming infected, resulting in a walled-off abscess or diffuse cellulitis that requires radical surgery. Pyelography in Doctor Beach's hands has proved to be a harmless procedure and should be done immediately in every case of suspected kidney rupture. Then, if the integrity of the kidney capsule or pelvis has been impaired with resultant extravasation, the tear can be sutured, the wound drained, and the possibility of future nephrectomy because of infection obviated.

Of particular interest in this series of cases is the absence of allegations of pain in the healed kidneys. In the beginning of industrial compensation, practically all workmen who suffered from ruptured kidneys expected to be permanently pensioned because of their backaches, which either did not exist or, if present, were due to infections of the seminal vesicles and prostate. A kidney can be pinched or torn without any discomfort to the patient, but pulling on the ureter or overdistending it causes instant pain. Hence, if pyelograms show the kidney in the proper position and with no abnormal mobility so that kinks cannot occur, all possibility of "kidney pain" is instantly ruled out.

Louis Clive Jacobs, M. D. (450 Sutter Street, San Francisco).—A perusal of Doctor Beach's thesis convinces us of the frequency of traumatic renal rupture.

However, there are various degrees of severity in renal injuries. Rupture of the kidney varies from the severe to the mild types. In the former there are present: shock, hemorrhage, hematoma, and urinary changes. In the latter there are few symptoms, practically no definite physical findings, and the patients recover without surgical intervention, with but a day or two of hospitalization. The mild type is more often referred to as contusion of the kidney. Inasmuch as every contusion of the kidney has at least a partial rupture, and in every rupture there is contusion, all these cases (for clinical classification) are considered as renal rupture.

The degree of injury is dependent upon the intensity of the traumatic force, the point of its application, and the resistance encountered.

The ureteral catheter and x-ray are valuable contributions by the urologist in substantiating the diagnosis and determining the character of the injury. A cystoscopy with ureteral catheterization and functional tests should be utilized wherever possible.

The passage of bloody urine is the most characteristic symptom of ruptured kidney. Blood occurs in over 90 per cent of cases. However, there may be an absence of blood cells in the urine; when merely the fatty or fibrous capsule is torn, without actual injury to the kidney parenchyma. On the other hand, in some cases, the only symptom directing attention to the kidney may be hematuria.

Very often blood is found in the urine when the kidney is not ruptured. In Doctor Beach's series, Case 7, the presence of red blood cells in the urine was the decisive factor in differentiation from an appendicitis.

However, very recently I examined a patient with numerous blood cells in the urine, with pain and rigidity over the right iliac fossa. On account of the localization of the muscular rigidity, the patient was operated upon for appendicitis. A pathological appendix was removed, which was followed by a disappearance of erythrocytes from the urine.

Of extreme diagnostic importance in renal rupture are the presence of muscular rigidity of the rectus on the affected side and a relatively increased resistance with marked tenderness below the costal arch.

To my mind, the treatment as formulated by Doctor Beach is ideal. Conservatism is the watchword. When bleeding is profuse, surgical intervention is indicated. An exploratory operation should be performed; but the operator must continually keep in mind that the extent and form of the surgery shall depend upon the amount of pathology present and the ease with which the bleeding can be arrested: by ligation, suture, or packs. Complete nephrectomy is often essential. When indicated, it should be carried out with rapidity.

Watson considers hemorrhage as the cause of death in eighty out of a total of 190 cases. Of the remaining, he attributes four deaths to septic complications, thirty-four to anuria, and eleven to shock.

Güterbock claims that in thirteen cases of nephrectomy performed on account of dangerous hemorrhage, only four died.

The mortality in septic cases can be directly traced to delayed operative procedure.

❦

DOCTOR BEACH (Closing).—It seems to me that a careful urological survey in these cases is essential to determine exactly the position, extent and degree of injury to the kidney.

After having made a diagnosis, the treatment must be adjusted to the circumstances.

To conserve whenever possible, is the parting thought I wish to leave with you.

PYOCYANIC ANGINA—WITH AGRANULOCYTOSIS*

REPORT OF CASES

By MADISON J. KEENEY, M. D.
Los Angeles

DISCUSSION *by Fred Linthicum, M. D., Los Angeles; John V. Barrow, M. D., Los Angeles; Ernest H. Falconer, M. D., San Francisco.*

THE title of this paper is possibly not scientifically accurate, but is used to call attention to some points of interest in a symptom complex about which much has been written in the past few years.

Schultz [1] of Berlin, in 1922, reported a group of cases in which the outstanding findings included a severe membranous or necrotic angina, with an unusual and distinctive blood picture and to which he gave the name "agranulocytic angina," or "agranulocytosis." Two cases of the type he described have come under my observation in the past few months. One of the case reports is here submitted.

REPORT OF CASE

Mrs. C., age forty-seven, married, housewife. First seen for present illness at her residence the evening of November 13, 1928, at which time she complained of a sore throat and general aching, which had developed that morning.

This patient had been under my observation at times for the preceding two years. In December, 1927 she was given a general physical examination because of a subacute arthritis. Nothing abnormal was found except several apical abscesses and extraction of offending teeth gave some relief. At this time the blood count showed a normal red blood picture with white blood cell count of 7000, with a normal differential, platelets plentiful, and a negative blood Wassermann.

On August 15, 1928, she appeared at my office complaining of symptoms referable to the lower bowel. Examination disclosed a small carcinoma of the rectum. Early in September she was operated upon for the carcinoma at a midwest clinic and returned to her home the first week in October in good general condition. Blood count made at the clinic showed red blood cells to be 4,700,000 and white blood cells to be 6000.

At the time of my first visit for the present illness, November 12, her symptoms were those common to the beginning of many acute infections and examination showed a red, angry-looking throat with some swelling but no exudate or ulceration. Twenty-four hours later a patch of grayish membrane appeared on the right tonsil, with swelling and some edema of entire throat and slight enlargement of the cervical glands. Temperature was 103 degrees F., and pulse was 110. The patient was evidently seriously ill and complained particularly of the presence of large amounts of sticky, stringy mucus in her mouth. Cultures were made from the throat at this time and sent to the city health department laboratory and a positive report for diphtheria was returned.

Necrotic exudate soon appeared on the other tonsil, the throat became badly swollen and small deposits of exudate appeared on the gums. Cultures and smears were again made from the throat and sent to the city health department laboratory and also to a private laboratory, as it was not believed we were dealing with diphtheria, for my first impression was that the case was one of the so-called septic sore throats. Report from the city laboratory on second culture was again positive for diphtheria bacilli.

Report from the private laboratory was as follows:

"Gram stain of smear showed a few epithelial cells, numerous Gram-negative bacilli, a moderate number of fusiform bacilli, and a few spirilla. Loeffler's blood serum slant showed a growth of a Gram-negative bacillus which produced a greenish discoloration of the media. Smear of growth stained with Albert's stain showed numerous bipolar staining bacilli resembling diphtheria bacilli. Gram stain showed the organism to be Gram-negative bacillus. Bacillus pyocyaneus."

A blood count made at this time showed a total white count of 200 cells, all of which were lymphocytes, approximately 4,000,000 red cells, and platelets plentiful. There was no tendency to bleeding from any mucous membrane, no petechia or other eruption. Spleen and liver were not definitely enlarged and there was no swelling of glands other than the cervicals. On the third day of the illness she developed a definite jaundice, and urine showed heavy bile as well as albumin and numerous casts. Early in the fourth day of the illness, signs of rapidly failing heart appeared, with cyanosis and râles in both bases. The patient died that afternoon. A postmortem was not permitted.

COMMENT

This is a somewhat incomplete report of a typical case of agranulocytic angina, occurring in a middle-aged woman. Schultz and his associates believe this condition to be a definite clinical entity. In a paper in 1925 Schultz, Wiener, and Jacobwitz [2] reviewed twenty cases which had been reported up to that time and outlined the characteristic findings as follows:

"The disease attacks both sexes and all ages, but most of the typical cases have been in middle-aged women in whom there was no evidence of abnormality or lowered resistance. Onset sudden, with high fever, toxemia and prostration; the duration of the disease very short and the death rate extremely high. Membranous and necrotic inflammations of the throat, especially the tonsils, were present, and in some of the severe cases there were ulcerations of the mucous membranes of the mouth, rectum, and genitals. Normal bleeding time and clot behavior, with absence of hemorrhagic diathesis, were characteristic findings. Clinically there was slight, if any, enlargement of spleen and liver, no general enlargement of lymph glands, and jaundice was present in more than half the cases.

"The blood findings were striking—a high-grade leukopenia—a total white count usually below 1000, often only a few hundred, and granulocytes extremely low or entirely absent. The few white cells remaining were practically all lymphocytes without the presence

* Read before the General Medicine Section of the California Medical Association at the fifty-eighth annual session at Coronado, May 6-9, 1929.